
Integration of an Evidence Base into a Probabilistic Risk Assessment Model

Lynn Saile R.N., M.S.

Advanced Projects

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The Integrated Medical Model Database:

An organized evidence base for assessing in-flight crew health risk and system design

Lynn Saile, RN, MS¹, Vilma Lopez, RN, MSN²,
Grandin Bickham, MCPD¹, Mary Freire de Carvalho, PhD¹,
Eric Kerstman, MD, MPH³, Vicky Byrne, MS⁴, Douglas Butler, MBA¹
Jerry Myers, PhD⁵, and Marlei Walton, PhD¹

¹ Wyle Integrated Science & Engineering, Houston, TX ,

²JES Technology, Houston, TX,

³TX University of Texas Medical Branch, Galveston, TX,

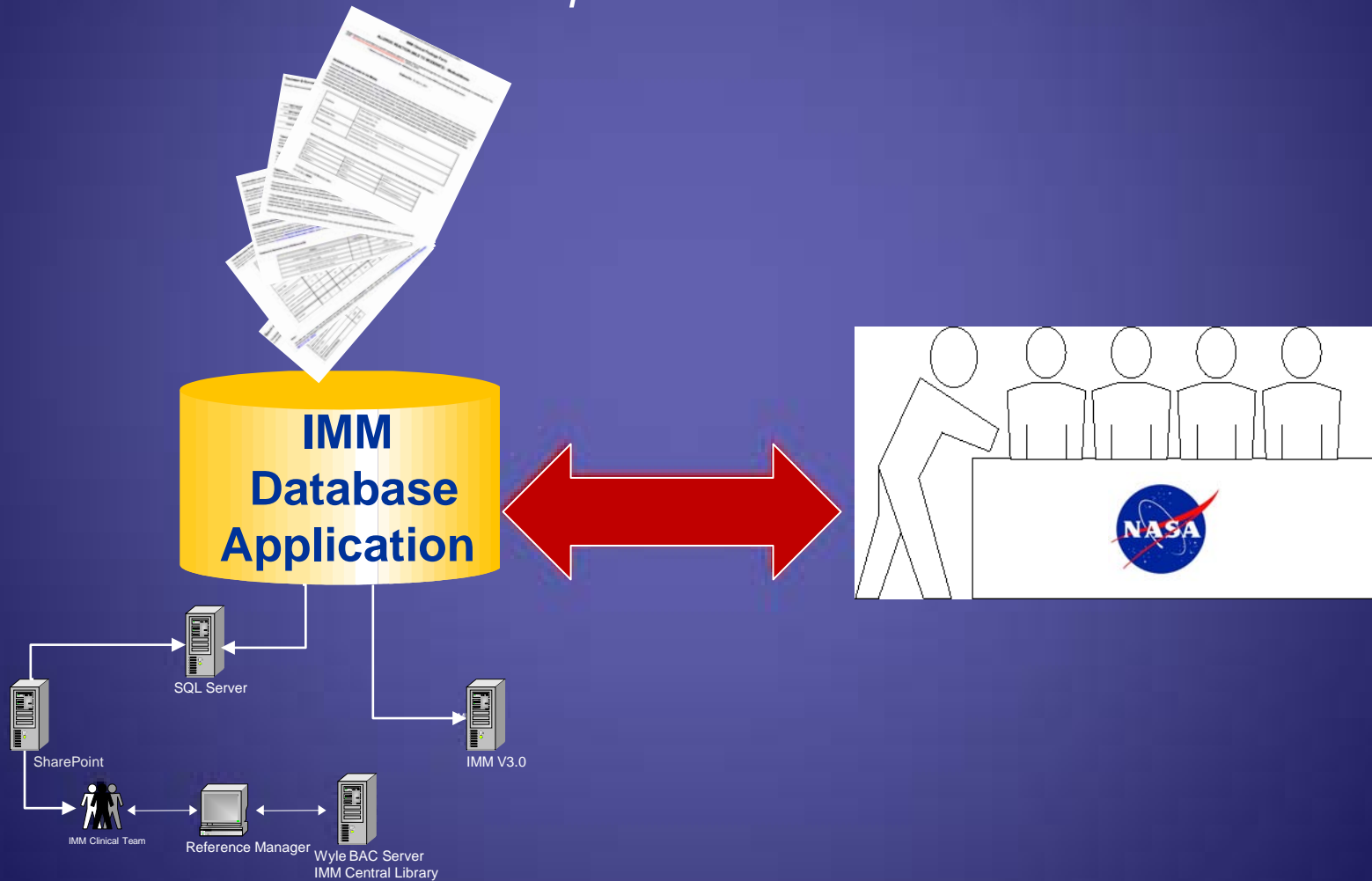
⁴Lockheed Martin, Houston, TX.

⁵NASA Glenn Research Center, Cleveland, OH,

Key Topics

- One-stop shopping
- Database Features & Innovations
- IMM Highlights
- Key Process
- Use history and new capabilities

IMM Database and Model offer one-stop shopping for the user of evidence-based reports and risk forecasts.



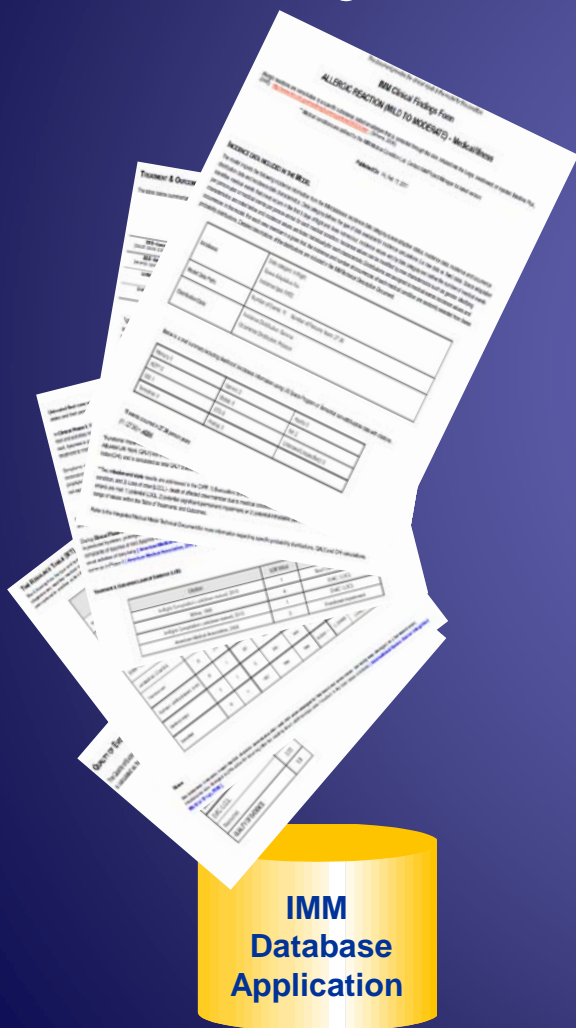
IMM Database has a broad spectrum of capabilities to offer to an extensive user base.

User Type	IMM Database Questions
Flight Surgeons	What is the likelihood that a crew member will develop nasal congestion?
Risk Managers	What medical conditions are associated with environmental factors that can lead to evacuation?
Vehicle Designers	For the assigned medical system mass allocation, what is the total mass for all of the injectable medications and their supplies?
Health Care System Designers	How many different medical conditions can potentially be diagnosed with ultrasound?
Trainers	What medical conditions will the crew be prepared to diagnosis and treat?
Requirement Managers	What is the mass and volume of the supplies needed for this crew health requirement?

IMM has a broad spectrum of capabilities to offer to an extensive user base.

User Type	Integrated Medical Model Questions
Flight Surgeons	What in-flight medical threats are greatest for reference mission A?
Risk Managers	What is the risk of evacuation - due to a medical event - for a 6-person, 180-day mission assuming the current in-flight medical capability?
Vehicle Designers	What's the optimum medical system mass allocation for a given level of risk?
Health Care System Designers	What medical items should we fly for a given mass/volume allocation?
Trainers	How do I prioritize limited medical training hours?
Requirement Managers	What's the rationale for this crew health requirement?

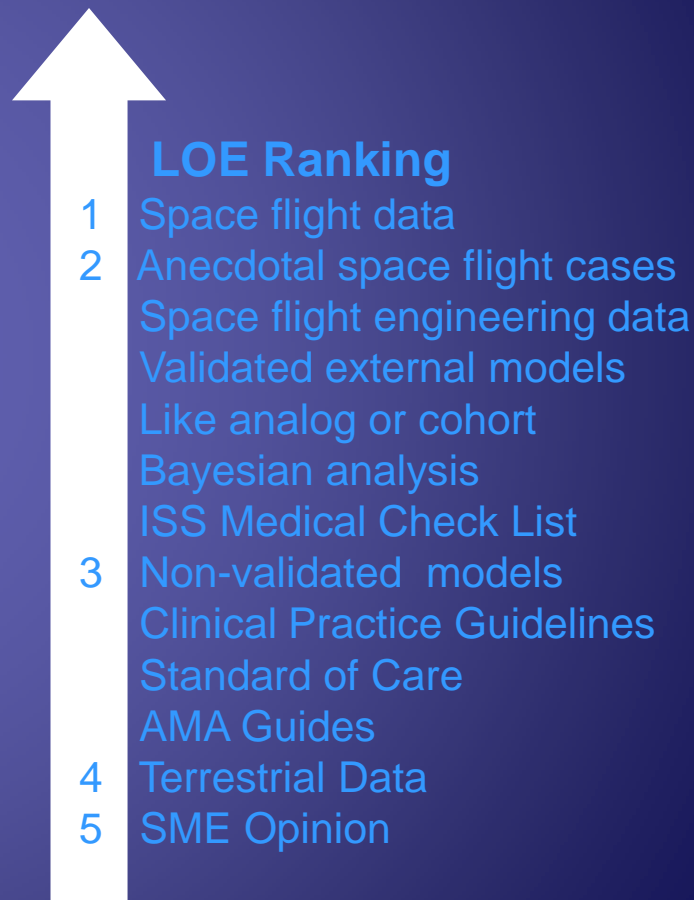
IMM Database is a robust tool that supports IMM along with offering customers a user friendly evidence-based platform .



- Objective; not subject to human error or “squeaky wheel” adage
- Input data are referenced and cited
- Organizational knowledge management tool
- Provides web accessibility for a customer friendly interface

The level of evidence (LOE) quantifies the model inputs according to a ranking based on highest value of data.

- **Unique to Space Medicine**
- **Follows 5-point scale similar to many conventional LOE scales**
- **Population is so different; crew are exposed to austere conditions & medical care is limited**
- **Space flight data are the most relevant input for the model**



Quality of Evidence

A quality of evidence (QOE) score provides an assessment of the evidence base for each medical condition.

Quality of Evidence	
Excellent	1-2
Good	2.1-3
Fair	3.1-4
Poor	4.1-5

- Calculation for QOE is the average of the categories of input data
- Averaging provides an objective assessment of the LOEs
- Allows IMM Team to manage evidence base
- Innovative practical use of the database

Assign LOE
1-5 & 1 being
the highest

Risk Component
Likelihood
Consequence
In-flight mitigation

Reference
Source

Reference Manager allows the IMM team to manage their citations and collaborate with colleagues.

- **Created a centralized multi-user library for the IMM Team**
- **Allows online searches**
- **Formatted reference lists**
- **Integrated with the IMM Database via an export**

The Integrated Medical Model (IMM) estimates crew health, resource utilization, and mission outcomes during space flight using a stochastic model.

- **Useful for comparing risks among multiple mission profiles**
- **Analysis of the data from IMM is highly flexible and is modified based on customer needs**
- **Optimizes medical kits based to maximize crew health or minimize undesirable mission end states within space flight constraints**

IMM Database's key processes are critical to organization, customer service and maximizing the success .

- **Integration in IMM represents just a starting point**
- **Configuration management built in**
- **Open reviews to external SMEs**
- **Incorporated into Validation & Verification plan**



IMM project uses a range of communication techniques to reach the various audiences.

- **Proactive outreach to user groups**
- **Educational presentations**
- **Project reviews**
- **Status reports to stakeholders**
- **Rap forums**
- **Exhibit**

The IMM evidence base has been able to provide invaluable information.

- **Science Management Office review of incidence data**
- **Storage Capacity Requirements of Vomitus/Diarrhea for Constellation**
- **ISS Medical System redesign**
- **ExMC Medical Condition List evidence base**



The IMM Database offers multiple services to vast user groups.

Database is relational and can be queried, allowing users to:

- **Manage complex data sources and ranking of data,**
- **Provide reports by integrating variables for detailed analysis,**
- **Interfaces with multiple software and databases and**
- **One-stop shop for evidence-related space medicine.**

Let's get started and give us a call.

Point of Contacts include:

Doug Butler, Project Manager

dbulter@wylehou.com 281-212-1380

Dr. Eric Kerstman, Clinical Lead

ekerstman@wylehou.com 281-212-1305

Lynn Saile, Clinical Project Manager

lsaile@wylehou.com 281-212-1488

Dr. Mary Freire de Carvalho, Lead Modeler

mary.freiredecarvalho@nasa.gov 281-461-2676



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Charles Minard, PhD¹

Scott Berryhill¹

Sam Strauss, DO, MPH²

Kathy Johnson-Throop, PhD³

David Baumann³

¹ Wyle Integrated Science & Engineering, Houston, TX ,

²LZ Technology, Houston, TX,

³NASA, Johnson Space Center, Houston , TX.

